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Our cover:

Andean Lithic Period

In the central Andes, the Lithic Period is the first stage in the chronological periodization of Luis Guillermo Lumbreras, Peruvian anthropologist, archaeologist, and educator, which extends from the arrival of the first nomadic hunter-gatherer populations to the beginning of the domestication of plants and animals [1]

Pinturas rupestres de una de las cuevas de Toquepala, cuya antigüedad se ha calculado en 9000 años [1].

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"Por la gracia de Dios"

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CONTENTS

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Editorial

A post-pandemic world

The world is going through a health situation that has transformed daily life and has generated changes in all productive sectors. This chain of consequences, negative to a great extent, has also allowed the generation of ideas, undertakings and new adaptive scientific developments that promote new ways of life, new ways of communicating and countless new academic, industrial, business and political proposals that restructure new societies.

The scientific, technological and social evolution resulting from the COVID-19 pandemic is undoubtedly an unexpected event for the world, but it opens new horizons that will define the modern world, and that will lead to new professions and new ways of communicating in social environments. While digital media were already gaining ground in human exchange, they are now indispensable for survival.

Issue 5 of the Minerva Journal of Scientific Research presents the results of research that reveals the new challenges of science, technology and innovation, as well as the necessary transformation of education to train the professionals needed for the immediate future.

Dr. Franyelit Suárez

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Education Priorities in he Wake of the Covid-19 Pandemic

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Abstract: This paper presents the identification, through consultation of the most up-to-date literature, of those fundamental skills that should be taught in schools and that should be prioritized irrespective of the technological resources available. To address the issue, it will first outline how the Covid-19 pandemic has permanently changed the form and content to be taught in education systems. To this end, a bibliographical synthesis of the approaches in the most up-to-date literature referring to the problem raised was carried out. Most of the research focuses on how to transmit specific content and not on what and why it is relevant to educate and how to achieve it. Finally, a systemic analysis was carried out on why some skills are priorities that are likely to be taught as opposed to others, offering conclusions in this regard.

Keywords: Fundamental knowledge, teaching methodologies, digital tools, teaching-learning, COVID-19.

Prioridades de la educación como consecuencia de la pandemia del Covid-19

Resumen: Este trabajo presenta la identificación, mediante la consulta de la bibliografía más actualizada, de aquellos conocimientos fundamentales que deben ser impartidos en los centros educativos y que deben priorizarse independientemente de los recursos tecnológicos disponibles. Para abordar el tema, primero se expondrá de qué manera la pandemia del Covid-19, ha impactado de maneras disruptivas en la economía y la política y la sociedad, cambiando la forma y el contenido que debe impartirse en los sistemas educativos. Para ello se realizó una síntesis bibliográfica sobre los enfoques en la literatura más actualizada que haga referencia a la problemática planteada. Se evidencia que la mayoría de las investigaciones se inclinan a las formas de transmitir un contenido específico y no en qué y por qué es relevante educar y cómo lograrlo. Por último, se realizó un análisis sistémico sobre por qué son prioridades algunas habilidades que son susceptibles a ser enseñadas en contraposición con otras, ofreciendo conclusiones al respecto.

Palabras Clave: Conocimientos fundamentales, metodologías de enseñanza, herramientas digitales, enseñanza-aprendizaje, COVID-19.

I.INTRODUCTION

The global Covid-19 pandemic has forced large numbers of students at all levels and on all continents to stay at home [1]. According to UNESCO, approximately 156 million students [2] and 68 million teachers are affected in Latin America alone. Underlying these statistics are the approximately 13 million students who did not receive classes of any kind during the time the pandemic has taken in the region. Globally, more than 235 million students are similarly affected [3], exacerbating the inequalities between those who can access distance education and those who cannot. The statistics clearly show that the world, and thus education systems globally in general, were not prepared for an event of the magnitude that has led to the current pandemic [4] The global reaction to the emerging problem of the coronavirus and its direct impact on education was a hasty migration to the available digital platforms [5] [6], which had several consequences:

1.Forced school dropout for those students who did not have the means to connect remotely to digital platforms [7]. While there are a number of structural causes to explain pre-pandemic school dropout, these groups are now joined by those students who are regularly enrolled in school but do not have the material means to access the various online learning portals [8].

2.Students, especially in the first levels of schooling, now depend on the support, time and training of their parents to cope with the assignments of each of the subjects subject to learning [9]. This, depending on the socio-economic conditions of the household, can be an additional element of economic stress within the family.

3.The fragmentation of online learning vehicles has resulted in students using four or more different digital platforms to complete assignments and to view lectures [10].

4.Stress, depression, anxiety, among others, have increased among the student population. Several studies around the world have shown [11] [12] [13], that they are being victims of these ailments.

5.Teaching methodologies through digital channels -although it may seem obvious, it is not- are different from those used in face-to-face systems. Teachers have been forced by an unexpected reality to make drastic and accelerated changes in their teaching-learning models. These transitions are not pleasant for everyone and resistance to change has been evident at all levels; however, the transition is not reversible and teachers are immersed in a process of profound change whose collateral effects are felt in the general decline in student performance and the effectiveness of the knowledge they seek to impart.

6.The states have had to face unprecedented challenges, from the logistics necessary to maintain minimum educational operability, safeguarding the universal right to education, to the creation of new schemes to avoid a generalized debacle in schooling and academic performance that in the future would harm the creation of national wealth. [14].

Although one could enumerate more consequences on the education system of the countries, it is clear that the complexity of the moment requires not only a situational analysis but also timely proposals that help to direct the material and human efforts in terms of the fundamental objective, which is none other than that the students learn the skills that are taught to them. In this line of thought, once the total closure of schools had been adopted, the countries generally followed three lines of action. These were as follows [15]:

1.Distance teaching-learning modalities with or without technology.

2.Mobilization of teaching staff to environments where there is a school population at higher risk of dropping out of school.

3.Comprehensive health and welfare care for students.

Although the above measures adopted by states can be generalized for many countries as an objective reality, this paper addresses the necessary actions for the Latin American reality. These actions focus on what would be the fun-

damental knowledge that regardless of the methodologies to be used, form the basis of the learning that each student must master, in contrast to the general tendency to maintain pre-pandemic knowledge but varying the teaching and learning methodologies. To this end, the work consists of four distinct parts: an introduction to the problem studied, which is presented above, another section in which the theoretical criteria that underpinned the research are developed, then the methodology followed in this work is presented, and finally, the results and conclusions reached are offered.

II.DEVELOPMENT

The global crisis caused by the COVID-19 pandemic has changed the world's educational landscape. Latin America has not been exempt from the multiple consequences that this situation has had on its education systems. The measures are taken in general, and not far removed from those adopted by many countries in the world in the field of education, were: the closure of schools and the accelerated, massive, and therefore improvised migration to online education [15] School closures, despite those who claim that they are not a good measure to stop the spread of the virus [16], were adopted to support a general social distancing. Undoubtedly the measures of social distancing and confinement are taking a heavy toll on the entire region, which, according to data collected on the consequences of the pandemic, will have more than 200 million poor people by the end of 2020 [17], indirectly reflecting the challenges the region faces in providing education and health during the current difficulties.

Education through online tools requires resources that not all families and students in the region can afford. Asynchronous distance education, which does not use technological tools and uses the human and technological resources of educational institutions to bring them closer to the most vulnerable communities, requires the will and resources of the state so that, together with effective methodologies, these groups can be served. Reviewing current scientific documentation and the dissemination media of international organizations such as ECLAC, UNESCO, and others, we can observe the methodological positions adopted by states, ranging from fully online education, education with mobilization of human and technological resources and those who opt for asynchronous distance education without digital technological resources [15]. It was observed that all four actions or a set of actions were used to meet the educational needs of learners in different countries.

A.Online education: synchronous education

One of the challenges of education in the pandemic and with schools closed, was to maintain contact between students and teachers, either synchronously, i.e. live classes between students and teachers, or asynchronously with or without technology [18]. It, therefore, became essential to choose the means that would enable this purpose. This is where virtual meeting platforms come in to play their role in achieving synchronous interactions.

Before the COVID-19 pandemic, some platforms allowed video conferencing in real-time or live, which means that a group of people could connect through the internet with other people located hundreds or thousands of kilometers away at the same time, to share points of view, business tasks, seminars, among many others; this type of platform would later enable synchronous distance education. Among the platforms in this segment were Cisco Systems' videoconferencing system, WEBEX, which allows meetings of up to 24 hours [19]. There was also Hangouts On Air, a platform developed by Google that allowed direct conferencing, where up to 8 people could connect at the same time. Both had the possibility, for the duration of the event or conference, of live chat, screen sharing, and other features [20]. We can also mention Skype, an application acquired by Microsoft, in which video calls could be made between an exhibitor and four interlocutors with similar features to those already described for other platforms. It should be said that all of them were designed for collaborative business environments.

With the emergence of COVID-19 on the world stage, existing platforms had to adapt to the demands now coming from the education sector, some were better able to adapt than others to facilitate mass virtual meetings. In this scenario, Zoom, Microsoft, and Google were able to position their products more effectively. Virtual meeting platforms such as Zoom, Google Meets, and Microsoft Teams were able to attract the largest number of users [21] [22] [23] with 300, 115, 44 million people connected daily.

With these tools, students were able to maintain communication with their teachers as long as both teachers and students had access to the necessary digital resources, such as the internet, computers, tablets, or smartphones.

ECLAC in its 2020 report showed that only four countries in Latin America used this type of resource [15], from which it could be concluded that access to these resources was not available to a high percentage of students, due to multiple factors, among them could be included the speed or bandwidth required for these encounters and the avai-

lability of connections of this type.

B.Online education: asynchronous education

The objectives of asynchronous online education are:

1.To deliver content that is in line with the curriculum.
2.To allow the learner to create his or her teaching and learning schemes at a pace that best suits him or her.
3.Provide teacher and parent guides as well as digital resources such as textbooks, workbooks, etc.

Most education systems in Latin American and Caribbean countries, despite having digitized books in virtual libraries and educational portals with access to online resources for both teachers and students, were not designed for the demands of fully remote education [24]. Therefore, the crisis had to be dealt with on the fly by planning strategies that would prevent the deterioration of learning in general and school dropout. One of the best-prepared countries was Uruguay, which took advantage of everything developed in the Ceibal Plan, which is a platform that allows the management of learning at all levels of the Uruguayan education system [9] to keep the nation's education system operational, despite the challenges in the more isolated areas with less access to connectivity. Other countries such as Peru, Colombia, Costa Rica, Mexico, and others have virtual libraries organized by subject and grade level that can be downloaded; however, the alignment with the curriculum of each grade level varies considerably among them. Overall, according to ECLAC, asynchronous online distance learning was adopted by 18 countries in Latin America and the Caribbean [15]. This means that teachers relied on educational resources available on the Internet to respond to the educational needs of students. These resources could be state education systems, such as the Ceibal case in Uruguay mentioned above, or open, such as the resources of the Khan Academy, which makes available to anyone who wants to access its platform, information, and practices covering subjects such as mathematics, computer science, economics, and others. Asynchronous online education is called second-generation asynchronous education.

C.First-generation asynchronous distance education

As mentioned in previous sections, the strategies adopted by Latin American and Caribbean countries were similar to those adopted by most countries around the globe. We have already mentioned the use of synchronous virtual classrooms, which was by far the least popular of the available strategies. Others, such as second-generation asynchronous online classes and classes delivered by first-generation technologies such as print, radio, and television, were the most popular. The combination of the two, together with the displacement of both human and technological resources to communities, represented the bulk of the strategies implemented in the region.

Countries such as Argentina, Venezuela, Haiti, Barbados, Chile, and others [24] have relied heavily on these technologies to maintain the continuity of education, mainly due to the existing limitations of internet connection for large sectors of the population. Argentina and Mexico are among the countries that have a significant offer in these media, while Ecuador and Peru have integrated television programs in the native languages of these countries, both by subject and by level or grade.

The main function of this strategy is that students who do not have technological resources such as computers or the internet can maintain the connection with the curricular program of their respective grades, executing the assignments with the support of their parents or guardians. This represents an important level of commitment on the part of the state to maintain the corresponding follow-up of the students concerning the progress expected of them.

D.Assisted education: movement of human and technological educational resources

In this modality, the human and technological personnel available in the countries' educational systems are displaced to attend to the educational needs of those populations that lack even the resources of first-generation technologies. Many countries in the region still have rural and urban communities where the lack of health, road, and educational infrastructure is evident. It is these sectors that have been served by the displacement of educators and pedagogical materials to prevent school dropout. According to ECLAC data [15], the challenges faced by states in attending to these communities are complex, and even before the pandemic, there were already serious complications.

E. Analysis of the regional education situation

According to what has been observed, the concern of the states revolves around the continuity of educational work by the most expeditious means at their disposal and, taking into account that no state was prepared to face a scenario such as the one that COVID-19 has forced the planet to confront, it is natural that the early stages of the crisis were marked by haste and improvisation. However, after the time that has elapsed, it is necessary to assume that a methodological strategy is required that prioritizes what we will call the fundamental knowledge that must be prioritized over others that can be learned in a state after the current moment. We have seen the strategies that have been carried out by the states to only maintain the educational continuity of the programs that existed before the pandemic, but which are now questionable in the face of the reality that is observed today. The methodology of this work focuses on a bibliographic study of the research carried out during a year while the COVID-19 pandemic was unfolding, observing that there is no development of what knowledge should have been prioritized over others given the extraordinary circumstances of the moment.

III.METHODOLOGY.

The most recent bibliography available in the Scopus, Scielo, Latindex, and Redalyc indexing databases was used as scientific-academic support for the preparation of this paper. The search was focused on those works that showed methodological approaches whose objectives were to avoid the loss of quality in teaching and that proposed how to approach a set of critical learning according to the level of schooling. Support was also sought from documents and reports from multilateral organizations such as the UN, UNESCO, ECLAC, and IDB, among others, to learn about the political and socio-economic dimension and their recommendations to countries on this issue (fig. 1).

In the first instance, 130 articles on the subject were compiled, 25 of which were selected as being closest to the focus of the proposed work; the remaining 105 did not contemplate a focused practice on the subject, and were focused on teaching methodologies rather than teaching priorities. From them, we extracted the main methodological processes proposed by the authors. The reports of the multilateral organizations were then integrated and contextualized with the academic proposals developed in the selected articles. By analyzing the scientific and academic approaches to education in Latin America and the Caribbean, as well as the actions employed by states in that direction throughout the current COVID-19 pandemic, the following results were obtained.

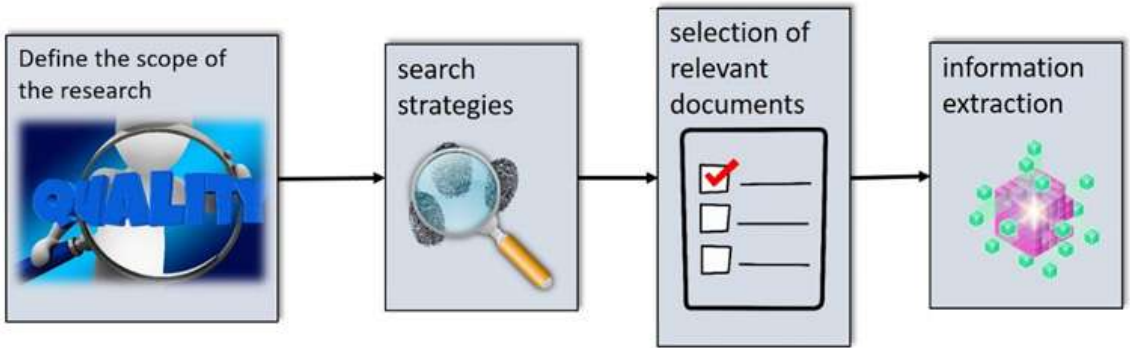

Fig. 1. Literature review descriptors [25].

IV.RESULTS

Twenty-five research articles dealing with the challenges faced by education systems in Latin American and Caribbean countries were selected. Reports written by multilateral organizations such as UNESCO, ECLAC, and the IDB were added to the research corpus, which statistically reflects the actions taken by the different countries to respond to the educational challenges caused by the COVID-19 pandemic. After reading all the selected information, the following results were obtained:

1.The actions taken by most countries to maintain the continuity of education were a combination of the following resources: providing digital content through online libraries (second-generation technologies), use of social media, and printed material. Use of print, radio, and television (first-generation technologies) for asynchronous delivery. This selection was the majority in the region. Those countries that used virtual meeting platforms or learning platforms

(synchronous education) were the fewest, with only 7 out of an average of 26 countries using these resources to deliver education to their students. [24] .

2.There is no significant differentiation between the educational strategies implemented in the region (those mentioned above), the grade to which the pupil belongs, and the subject being taught. This implies that very similar methodologies are used whether the pupil needs to learn language or mathematics and whether he/she is in the last grade of secondary school or the first grade of primary school.

3.The education policies implemented remain contingency actions for the duration of the pandemic so that in many countries there are no tactics to structure strategies that not only prevent the weakening of the education system before the pandemic but also promote new approaches that allow for its sustained recovery over time and enable it to advance to new levels of educational competitiveness.

4.A significant percentage of articles focus on distance education through the use of Information and Communication Technologies (ICTs). Despite highlighting the difficulties faced by many families and entire communities in the region that do not have access to the internet, computers, or smartphones, there is no clear and methodical strategy to address these populations.

5.Of all the articles and reports analyzed, only the ECLAC report and two articles [15] [26] [27] refer to the need to prioritize certain content over others and to change teaching-learning methodologies because the current reality makes it clear that there are competencies and learning that have proven to be vital and should be reinforced.

6.In none of the articles analyzed is there any important reflection on which skills and knowledge were shown to be fundamental in the logical-mathematical area, or the area of language according to the level of the student's course, or in other subjects. On the other hand, it is mentioned that it is important to involve human competencies such as solidarity, self-learning, management of emotions, sense of social belonging, health care, among others, in a more organic way [15].

7.There is an almost unanimous consensus on the need for teacher training in the use of digital tools, in the management of contingencies, in the creation of quality pedagogical content adaptable to various models of educational transfer. [5].

V.CONCLUSIONS

The following conclusions were drawn from the analysis of academic articles, reports by multilateral agencies and the results obtained:

1.There is a set of fundamental lessons, and it is these that must be prioritized in extraordinary situations such as those produced by the COVID-19 pandemic.

2.Fundamental learning has three aspects: logical, communicational, and moral-ethical. Priority should be given to learning mathematics and the fundamental principles of computing, fluent language skills, and knowledge and practice of values such as solidarity, self-learning, resilience, a sense of local social belonging, health care, etc.

3.Learning should be oriented according to level and subject. It is necessary to focus the curriculum on the knowledge and competencies described above and to relegate those that become peripheral to after the current conditions have been overcome.

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Confinement, Stress and Attitudes in Pandemic Times

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Abstract: A review of the emotional aspects that occur during the COVID-19 pandemic is presented. Relevant results are presented showing that stress has been an essential element in all scenarios in times of confinement. However, in the periods and schedules where there is no confinement, stress is also present in people. In spite of this common feature, there are small groups that do not show stress in the face of confinement and, on the contrary, have managed to cope effectively with this situation, carrying out undertakings or activities for personal improvement. Among the most relevant conclusions is that attitude is fundamental for adaptation to change and improvements in quality of life.

Keywords: Confinement, attitude, stress.

Confinamiento, estrés y actitudes en tiempo de pandemia

Resumen: Se presenta una revisión sobre los aspectos emocionales que transcurren durante la pandemia por COVID-19. Se exponen resultados relevantes que muestran que el estrés ha sido un elemento esencial en todos los escenarios en tiempos de confinamiento. Sin embargo en los períodos y horarios donde no hay confinamiento también existe un estrés presente en las personas. A pesar de este común, se observan pequeños grupos que no manifiestan estrés ante el confinamiento y que por el contrario han logrado sobrellevar de forma efectiva esta situación, haciendo emprendimientos o actividades de mejoramiento personal. Entre las conclusiones más relevantes está que la actitud es fundamental para la adaptación al cambio y las mejoras en la calidad de vida.

Palabras Clave: Confinamiento, actitud, estrés.

I.INTRODUCTION

Stress is a reflex of the organism to certain situations [1], which triggers a physiological reaction in the organism producing certain emotions in people. Stress can manifest itself differently in each individual, and can have different causes depending on the type of person [2]. These emotional situations are present in people's daily lives, and can be minor or major depending on the stressor stimuli and the individual characteristics of each person.

The pandemic has brought to light a set of political, social and family situations that were not previously visible. For example, the lack of preparation of the States to face social situations such as COVID-19, which in addition to bringing health consequences, has unleashed a compendium of social situations associated with it, as is the case of confinement, teleworking, online education, among other consequences.

Confinement was an interesting topic for this study, since it will address those aspects that have been observed from different sources on the situation of confinement for people, from changes in family habits, to changes in work and attitudinal habits of people.

The main results show that attitude is fundamental to cope with situations of confinement, the understanding and maturity of people to face new challenges without leaving home, is the key to personal and family growth in times of pandemic. Recognizing the risk and assuming the activities from home can be a solution to stay healthy and to undertake new ideas.

The pandemic has brought to light a set of political, social and family situations that were not previously visible. For example, the unpreparedness of the States to face social situations such as AIDS-19, which in addition to bringing health consequences, has unleashed a compendium of social situations associated with it, such as confinement, teleworking, online education, among other consequences.

II.DEVELOPMENT

The new times demand above-average job skills, which include not only the knowledge acquired from university studies, but also the skills acquired in a complementary way. In addition, knowledge of computer tools has become a necessity for each and every job, which every day are migrating their processes to other automated, more complete and online, that optimize systems, and improve the presentation of products and business objectives.

The situation of social isolation brought an imminent need for online activities, one of the most affected being education, firstly because the educational system in Latin America is framed in a traditional process, face-to-face with traditional methodologies, and secondly because there is no appropriate technological infrastructure to address all aspects involved in an online education, bringing with it some psychosocial risks [3] that considerably affect productivity and health problems in people.

The application of surveys in times of pandemic has been a daily routine [4], many times to know the different personal situations in the face of such a controversial world scenario. However, this type of studies has also caused a problem of stress in people, who are constantly being evaluated by different academies, institutions and specialized centers.

A.Stress disorder in previous pandemics.

Several studies show that situations of confinement have a great impact on people, causing important changes in their life routines, which may even continue after the quarantine period has passed [5], [6].

The health problems caused by pandemics also have serious consequences for those affected, not only for the sick, but also for their families, physicians, and other social sectors that are affected by the continuous human losses.

Other studies reveal that between 27.5% and 83.3% of people affected by Ebola presented significant symptoms of anxiety and stress, reaching up to 75% of depressive symptoms [6]. Stress can be caused by any or all of the situations adjacent to the health problem, involving fear of contagion, fear of job loss, home and family needs, and confinement.

B.Resilience and adaptation

The concept of resilience is something that has been studied in recent years, to refer to the ability of a person to overcome adversity. Several studies have been conducted to try to understand the factors that influence a person to have more capacity than another to overcome the complexities of the circumstances that he or she may experience [7].

Among the most relevant characteristics necessary for a person to have an appropriate resilience, those related to personality stand out, where the attitude of the individual plays a fundamental role. But external factors also have an influence, such as the support of the family environment, friends, among others [7].

The health situation that the world is going through causes anxiety and stress in people, which lead to unfavorable actions within the family context, and have repercussions on work productivity [4], [2], [7], [1].

A positive attitude is necessary even in spite of the experiences and difficulties, since it is observed that attitude is fundamental to assume the pandemic in a more proactive way, to understand the confinement as an opportunity to value other aspects of life and to restructure other social habits. Figure 1 shows some aspects necessary to assume different adverse situations with a better attitude, or with resilience.

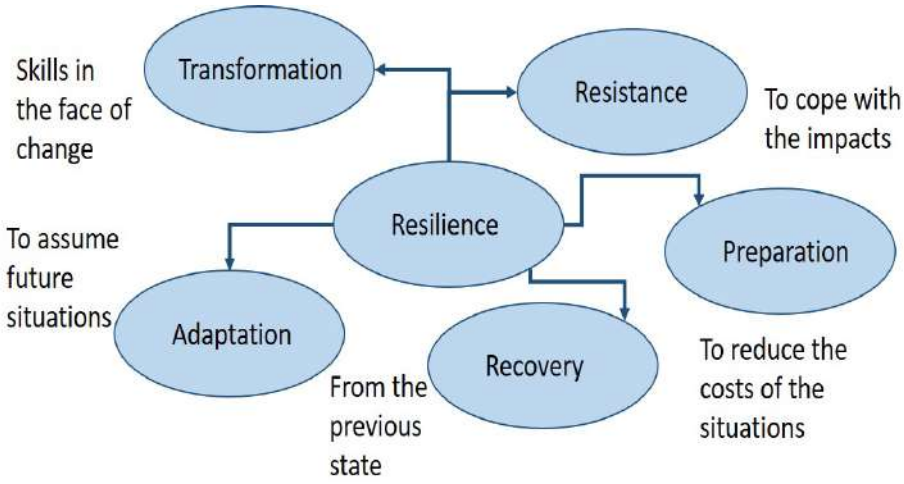

Fig. 1. Important aspects to assess resilience as a personality trait.

III.METHODOLOGY

This work was carried out with a methodology based on a documentary review of the aspects associated with confinement during the COVID-19 pandemic. For this purpose, a systematic bibliographic search of academic scientific documents containing relevant information on the topic of study was considered, but also those works from reliable sources and whose results allowed a contribution to this research were evaluated. Figure 2 shows the basic outline for this work.

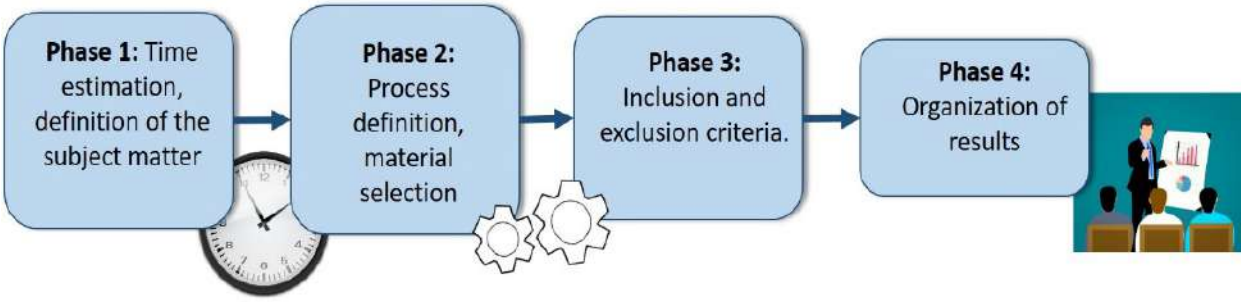

Fig.2. Phases of the research

For each of the phases of the research, the following was taken into account:

Phase 1: The estimation of the time of execution of the topic was carried out, in order to organize the documentary material taking into account the pandemic situation started in 2019.

Phase 2: The selection of the material was carried out, taking into account the topic of study, in order to define the

research process and the most relevant aspects regarding confinement and social behavior.

Phase 3: Inclusion criteria were evaluated (topic of study, topicality, relevance, pertinence, reliable source, scientific writing) and exclusion criteria were also considered (low pertinence, unreliable sources, antiquity, not indexed, documents without identification data).

Phase 4: The results of each source were organized in order to offer a single criterion focused on the topic of study.

IV.RESULTS

Important studies [8] reveal that there is a high tendency to anxiety in people, as well as high to medium stress, in addition to altered stress, even having a significant tendency to depression, but no significant suicidal tendencies were revealed (Fig. 3).

Emotional states reveal the way in which people assume the different stressful stimuli [1], managing to express or sustain a certain emotional state according to the characteristics of each individual. Thus, it is not possible to associate stress as a consequence of anxiety, nor vice versa, but both reflect an emotional state of distress in people, which may have different sources but which affect the individual in an important way.

The situation of confinement can have diverse appreciations, depending on the attitude and particular situation of each person. But in all cases it has caused significant changes in the daily routines of families, work and academic spaces.

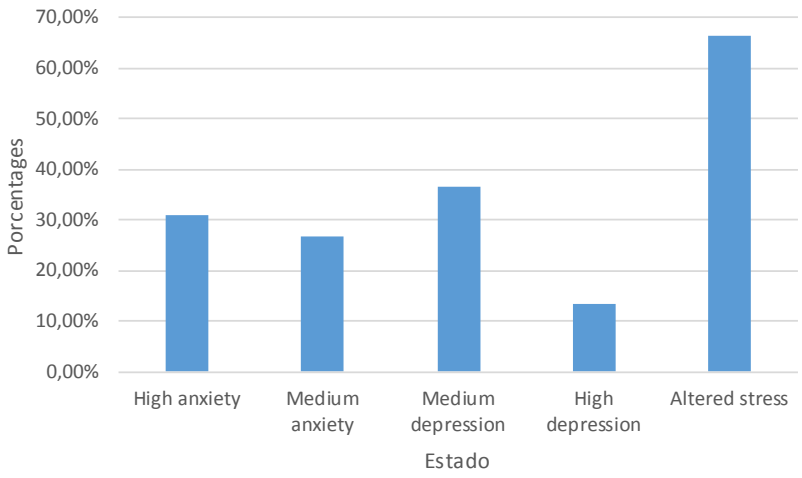

Fig. 3. Emotional states observed [8].

In shopping places and markets, stress has been increasing representatively (Fig. 4), influenced by the fear of contagion in social spaces, in addition to the fear of contaminated food and groceries. This has led to significant stress levels in markets [9].

Fig.4. Market stress level [9].

Stressful situations in the population during the time of a pandemic are unavoidable, but can be mitigated with appropriate medical care. In addition, it is necessary for individuals to weigh the health risks against the benefits of working at home, which include:

- Increased working comfort
- Reduced traffic problems.
- Meals prepared at home.
- Family sharing.
- Ease of organization and time management.

The attitude towards uncomfortable situations must be fundamental to be able to assume with greater tranquility the mishaps of the day to day. However, culture, habits and customs can have a considerable influence on the way in which daily vicissitudes are assumed. These same factors influence the way in which stressful stimuli are assumed and how they influence daily life.

The stress situation in the academic sector may be greater than in other sectors, because the educational system was not structured for online activities and methodological resources are limited. In addition, computer resources are not accessible to all sectors, leaving a significant number of children and young people out of communication. School dropout statistics in Peru are shown in Figure 5, showing a significant increase in recent years [10]. In total for the year 2020, the number of children not attending school in Peru is 230,000.

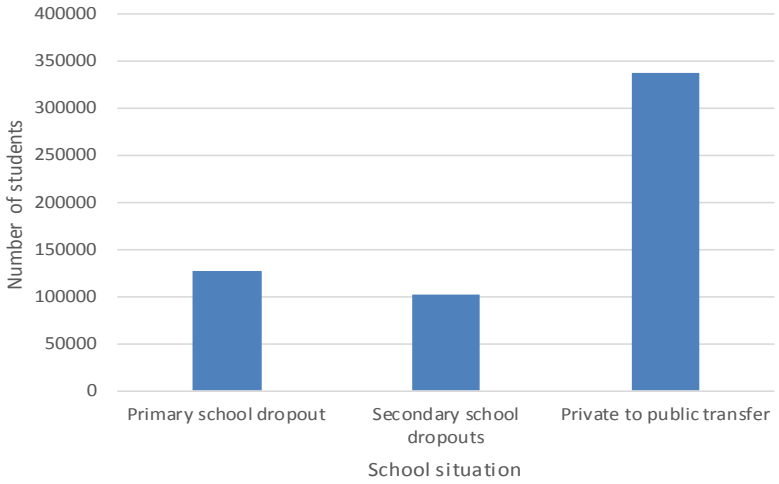

Fig. 5. School situation in Peru, year 2020-2021[10].

The pandemic situation aggravated these figures, since family economic problems are on the order of 75.2%, while family problems are at 12.3% and lack of internet due to failures or resources, at 4%. [10]. This leads to emotional consequences in the population, anxiety, depression and stress.

V.CONCLUSIONS

Once the bibliographic review has been carried out, it is possible to draw the following conclusions:

1.Stress is conditioned to stressor stimuli, and depends fundamentally on people's attitudes to cope with it, i.e., customs, culture, family, and individual characteristics. The continuous presence of stressful stimuli can be determinant for a difficult emotional state, which can trigger other consequences such as lack of motivation, illness, lack of productivity.

2.The confinement by COVID-19 has brought important emotional consequences, which vary between anxiety, stress, depression, and whose causes are also various, which include social distancing, economic problems, unemployment, excessive teleworking, limitations of computer resources, family situations, among others.La actitud individual puede ser una salida para atenuar los problemas de estrés en las personas, pues la resiliencia resulta un arma beneficiosa para sobrellevar los acontecimientos actuales causados por la pandemia y el confinamiento.

3.The global pandemic situation will not cease in the coming days, perhaps not even in the coming years, and humanity will have to adopt the necessary measures to cope with a new lifestyle, allowing economic, academic and social activation with the necessary limitations to maintain life and health.

4.For people who get other economic forms, they should consider confinement as a new lifestyle, to reduce health risks and ensure a better family future.

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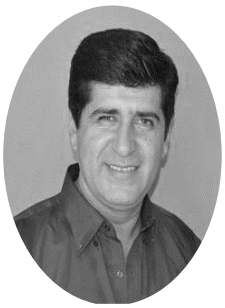

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Banana Paper Production

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Abstract: Paper is one of the most used elements in modern society, despite the fact that its invention dates back to ancient times. The paper is used for different domestic, labor and industrial purposes. Its manufacture is made from cellulose pulp and vegetable fibers, which have had a significant environmental impact over the years. This paper proposes the analysis of paper making from the use of banana plant residues, which could offer a better use of natural resources and a lesser impact on nature. In addition, the natural fiber of bananas is resistant and is easily obtained in Latin American countries such as Ecuador, which has a high production of this. The results found show that it is possible to make paper with fiber from banana residues and that it is possible to commercialize and make good use of resources.

Keywords: Pseudostem, paper, banana, circular economy.

Producción de papel a partir del banano

Resumen: El papel es uno de los elementos más utilizados en la sociedad moderna, a pesar de que su invención data de épocas remotas. El papel es utilizado para diferentes fines domésticos, laborales e industriales. Su fabricación se realiza a partir de pulpa celosa y fibras vegetales, que han tenido un importante impacto ambiental en los últimos años. En este trabajo se propone el análisis de la elaboración de papel a partir del uso de residuos de la planta de banano, lo que podría ofrecer una mejor utilización de los recursos naturales y un menor impacto a la naturaleza. Además, la fibra natural del banano es resistente y es de fácil obtención en países de Latinoamérica como Ecuador, quien presenta una elevada producción de este. Los resultados encontrados muestran que si es posible la elaboración de papel con fibra de residuos del banano y que es posible la comercialización y buen uso de los recursos.

Palabras Clave: Pseudotallo, papel, banano, economía circular.

I.INTRODUCTION

Currently in the Amazon every second a quantity of trees similar to the size of a soccer field is lost. This means a great impact for all the species that are part of this jungle ecosystem. The same happens in different parts of the world, as in Spain, where during 30 years approximately a quarter of the oak forests were lost. One of the industries that are largely responsible for this is the paper manufacturing industry, which produces huge amounts per year that are consumed by different countries around the world, and which yield significant pollution figures in all sectors.

The commonly used white paper requires 90% of cellulose from trees, which not only affects the vegetation, but also the environmental repercussions that this entails, since an average of 48 kilos of paper is consumed per person. One tree produces approximately 100 kilos of cellulose, which implies the felling of 3696 million trees per year [2], approximately 18 million hectares, which will not only cause environmental problems in the jungles and forests, but will also have an impact on rainfall and other environmental conditions.

The use of banana residue for paper production can be an important advance in environmental conservation. Latin American regions are high banana producing regions. Ecuador, due to its geographical location, is fortunate for its fertile and suitable land for banana production [3], achieving an average production of six million metric tons with a profitability of two and a half million dollars.

In the Ecuadorian territory there is an average of one hundred and sixty-two thousand hectares of banana plantations which produce rachis, which is the waste of the banana plant [3]. For this reason, and taking into account that the paper producing sector is not only important economically but also environmentally, the use of this waste represents a way to preserve the Ecuadorian environment.

By mentioning Ecuador as a country of agricultural activities, it is possible to obtain a series of advantages that can be generated to give a better incentive to this economy. These activities are usually like harvesting the fruits of the plants that grow on the Ecuadorian coast. The crops that stand out the most in this region of the country are commonly banana crops. The task that farmers perform is to cultivate and harvest, and then sell them, so when they do this work, they generate waste from the plants [4]. The farmers are not aware of how to make the best use of the residues, so they can be reused to obtain other by-products for food or paper manufacturing.

On the other hand, it is worth identifying the negative aspects associated with paper production, since several organizations have determined that the use of chlorine bleaching agents or toxic chemicals, which often cause air and water pollution, persists [3]. On the part of the customers, this introduction of new products is a bit strange, since people have become accustomed to the consumption of normal paper, which most of them do not like the change or this new product, innovation while a small part of consumers agree with the preservation of resources such as banana pseudostems [4].

In this work, the production costs of paper and its environmental impact are analyzed, and contrasted with the high demand it has with respect to the market, due to the participation of people to meet the different needs [5]. However, the cost of paper production has increased due to the different raw materials used for its production, being more environmentally friendly and healthier for people. Nowadays, paper recycling is very important to avoid future overexploitation of resources that will be suffered by future generations [3].

Likewise, a sustainable production of paper based on banana will prove to be more beneficial to reduce the stress on forest resources, the high degree of cultivation and consumption in recent times has become the second largest fruit crop in the world [6]. In addition, the main banana producers are China, the Philippines, India and Ecuador, where in Ecuador they are trying to obtain organic paper from banana stems, thus saving the felling of trees that are currently in excess. This is why the innovation in Ecuador in the production of paper has brought other countries to implement a new product to the market that generates greater added value for consumers and the company as such.

For the creation of the paper, two methodologies will be used. The first one seeks a dark brown paper with a rough texture, while in the second one more soaking time is applied prior to cooking, obtaining a medium beige paper with a finer texture. Similarly, the high acceptance of paper in the market is a clearer way for people to adapt to the change of a new product and what it would mean at a global level for it to become a daily consumption [5]. For this reason, an environmental culture should be promoted with the manufacture of organic paper by the different organizations that know that they are in a latent change with respect to products such as paper. Currently there is a growing trend towards the use of ecological products or products that promote sustainable development. On the other hand, paper as such does not have a substitute product, which is why paper made from banana pseudostems has a high potential demand. In addition, it should be taken into account that in Ecuador paper is imported from Canada, Chile, Brazil and the U.S., so that being a local product can also help reduce import costs. The import of tree pulp in Ecuador has a 12%

tax, which would be another cost that would be reduced with this product.

This work consists of four parts where we will explain this process that will help us to protect the environment, in the introduction we will talk about the current situation, the use of white paper and the raw material that we will use, in the second part that we will have for development will allow us to appreciate and know the production process of alternative paper, we will continue with a third part in which the conclusions will be observed, to finish with the bibliography that makes reference to the material used to be able to expose this topic.

II.DEVELOPMENT

Paper has existed since ancient times, its use was present in the year 200 BC [2], but it was in the 17th century when paper was handmade, but its use was not as great as the present, which allowed an environmental balance. Later on, its use grew, leading industries to improve their production processes in order to increase sales, but without considering the environmental repercussions.

Since the 1660's, due to the evolutions that have been generated within the technology, which have determined another type of methodologies regarding the production of paper ensuring a better quality, as well as the increase of the demand by the society adopted that tool in their daily life. It is when the appearance of obtaining paper based on vegetable fiber occurs, which has led to the deterioration of the ecosystem due to the existing deforestation, since approximately 15 reams of paper are obtained from a trunk, which shows that the felling of trees at a great level of increase [6].

Currently, there has been a certain awareness on the part of human beings who have sought ways to innovate and achieve a better sustainable development, with this has generated the idea of paper recycling, in order to promote another use and reach that efficiency with respect to excessive consumption of wood. A major problem according to traditional paper mills is the large amount of excess of polluting waste, since now the use of bleaching agents such as chemicals and also the non-incorporation of non-degradable material [7].

According to the responsibility of each person for the development of products that are not harmful to the ecosystem, there is a need to achieve a synergy between the environment and the human being. This is how the proposal for the development of paper based on the waste generated by banana producers, a fruit that is grown in Ecuador. The use of banana as raw material for paper is crucial in order to achieve a care towards the environment and therefore the determination of another technique that can effectively help with respect to the preservation of the ecosystem [3].

A.Paper elaboration process

There are 2 types of processes for the elaboration of organic paper, on the one hand the brown color and on the other hand the beige tonality with different cooking times, in the first instance there is a cooking time of 120 minutes or 2 hours, the second time is 2 hours 0 minutes and the last one is approximately 3 hours [6].

1.Peeling:In this first step for paper making, the rigid outer part that envelops the fiber is removed from the banana stems.

2.Chopping of the pseudo stems:As a second step, the pseudotallus fiber raw material is cut into small pieces of approximately 1-3 cm each piece.

3.Cooking:The previously cut pieces are placed in a container to then take them to the place where the cooking is going to be carried out, in the fire is boiled at 120 minutes, in addition a second sample of 150 minutes and up to a third sample of 180 minutes is carried out [6].

4.Liquefying of the fiber:As the next point it is left to drain for 1-2 minutes and subsequently liquefied with water so that the fibers are crushed correctly and passed through the strainer as many times as necessary, once the pulp is obtained, the fibers are washed until the water dries completely [6]. Once again it is drained again and a container is placed to proceed to distribute it in the mold.

5.Drying:As a last step we proceed to the drying part which should be done in a shade, in a place that is in contact with the air for 2 or 3 days to obtain the organic paper.

To make the other process of organic paper only varies by an additional step that this has for the color tone of the

paper that can be detailed as follows:

1.Peeling:In this first step in papermaking, the rigid outer part that envelops the fiber is removed from the banana stems.

2.Chopping of the pseudo stems:As a second step the raw material of the pseudocalli fiber of approximately 1-3 cm each piece is chopped into small pieces.

3.Soaking:The pieces or chunks that were previously collected are placed in a container and allowed to soak for 24 hours.

4.Cooking:The previously cut pieces are placed in a container and then taken to the place where the cooking is going to be done, in the fire is boiled for 120 minutes, in addition a second sample of 150 minutes is done and up to a third sample of 180 minutes.

5.Liquefying of the fiber:As the next smear it is left to drain for 1-2 minutes and subsequently liquefied with water so that the fibers are crushed correctly and passed through the strainer as many times as necessary, once the pulp is obtained, the fibers are washed until the water dries completely. Once again it is drained again and a container is placed to proceed to distribute it in the mold [6].

6.Drying:The drying is done in the shade, in a clear place for two or three days to obtain the organic paper and proceed to use it for various designs and a unique and different finish [6].

It is worth mentioning the above mentioned about how paper can be treated and elaborated through banana fiber. Now, the question that stands out most in this research is: Is it possible to maintain a positive impact for companies engaged in this activity with respect to their economy and the environment? The answer is of course. One of the factors that should be included is that the responsible and sustainable use of banana plants will generate impacts not only for the environment and the economy of the companies, but also for society and scientists [4]. Within these guidelines of positive impacts, one could begin by mentioning the impact on society. Responsible use will generate economic resources for the banana sectors of the country and neighboring countries. Since paper production has a high and constant demand over time, it will generate more jobs in order to avoid the use of wood trees that are massively used for the production of conventional paper. This will not only help companies dedicated to paper production, but also farmers who have a large amount of this resource, but due to lack of knowledge it is not used efficiently. Another impact that can be projected for the sustainable use of banana waste is that farmers will be able to benefit from a higher percentage of income. That is, the owners of the banana plantations, when selling the products of the plants, obtain income from sales, then after the cycle of the plant reaches the end of its life cycle, it will no longer be left to dry on the ground to serve as fertilizer, but will be able to access constant economic benefits for the paper companies. Given this, it opens multiple paths to the research sector, because it can be derived to multiple facets to add new knowledge for new products or more sustainable uses that are not currently known. In addition to being able to guarantee new ideas for the creation of industrial technology, in order to cover the correct use of banana residues, thus helping to eliminate the use of trees for the manufacture of paper and affecting the life of the forests.

B.Economic and Social Impact

Through the production of banana-based paper, the company seeks to create a socially responsible enterprise. In this sense, through this production process, we intend to support the local communities where the company is located. Initially, this will be done by collaborating with small banana producers, who will be the main suppliers of raw material that will allow the production process to be carried out. This is intended to generate a new income for these people. In addition, the people who will collect the banana peels will also be part of the community, thus generating new sources of employment. On the other hand, for the productive part, the company will also seek to have personnel from this area, which will be achieved through an extensive training process. It is of utmost importance that the company considers the social aspect, since within the business philosophy it is not intended to profit from others, but to generate a collaborative economy, a business model where services are considered a means of exchange, so that all interested parties can benefit.

On the other hand, it is of utmost importance to highlight that the quality of life of the community would improve significantly with this product, since the waste generated by the banana will not remain in the plantations, thus reducing the decomposition of the waste and radically reducing the risk of pests and therefore diseases. This project not only seeks to generate an environmentally positive alternative, but also to generate an option for economic growth in sectors that have not always been sufficiently considered. In a developing country such as Ecuador, it is important to create this type of growth opportunities from the smallest to the largest categories, so that power groups cannot monopolize the national market.

III. METHODOLOGY

The paper manufacturing process identifies that initially the wood must be obtained from the forests, which is transported by truck to the factory to extract the bark and the bark, then it is cut into small pieces, those pieces or chips are submerged at high temperatures in a mixture of water and some chemicals, sulfites and caustic soda in order to separate the wood fibers and thus obtain the cellulose pulp (Fig.1).

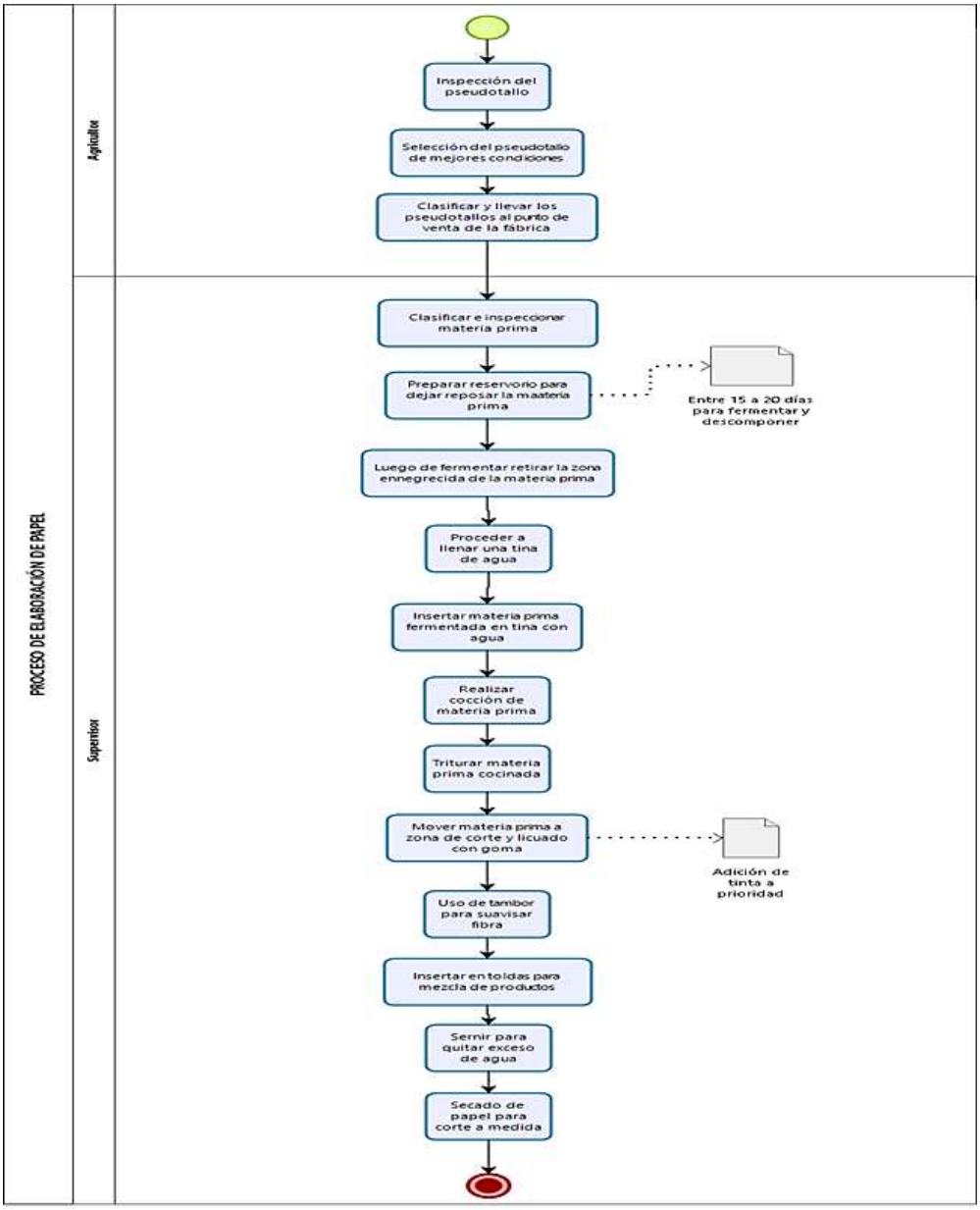

Fig. 1. Paper manufacturing process

After this process, the cellulose pulp is taken to the drums to apply other types of chemicals to bleach it, some of these are chlorine dioxide, oxygen, caustic soda and peroxide, with all this is to remove all the lignin not removed in the cooking. Thus, the pulp is placed on metallic meshes, where the paper takes shape while it dries and releases water, likewise, regulations are taken on the pulp according to the density, consistency and flow rate and it is placed on a flat table to build the sheet. Afterwards, the desired thickness of the paper is obtained by passing through rotating rollers where a mark can be printed. The paper is then pressed on rollers that are coated with felts to extract more water and a few more rollers to ensure texture, then a final phase of heated rollers to ensure drying and finally the surface treatment with cold rollers to give the paper a glossy finish.

The process to manufacture one ton of paper requires the felling of 17 trees, which implies a significant environmental impact, taking into account that one tree in one day provides enough oxygen for three people.

It should be noted that from all the waste generated by the banana cultivation process, paper can be obtained not only from the pseudo stems of the plant, but also from the banana stalks. Currently, banana waste generates pollution because it does not have an appropriate use; however, if the use of the waste for paper production is considered, two environmental situations could be solved at the same time. However, Ecuador is in a very complex situation with respect to the world in terms of using resources in a sustainable and responsible manner. Although initiatives have been taken on the subject, a much broader and responsible development is still lacking. The international environmental organization Greenpeace revealed that for any country to choose to focus on paper production and cover such a demanding market [3], it will be necessary to build for years two pulp mills similar to one already built by Botnia in Uruguay, which produces one million tons of bleached eucalyptus pulp per year.

A study by the Center for Technology Transfer and Agroindustrial Research (CETTIA) of the Universidad Técnica Particular de Loja, in Ecuador, has revealed that an optimal process for the production of paper from banana peel begins with the transportation of the rachis to the factory. When the raw material arrives at the company, the rachis (banana residue) is peeled and then taken to cylinders to separate the core from the trunk. The objective is to transform it into a pulp in order to separate the fibers (cellulose). Once the pulp is obtained, the process to follow is to place the fibers in aqueous suspensions between 4 and 12 gr/l with the intention of handling the dry fibers. This will generate the lamination of the pulp, with this, it will be possible to physically suspend the friction process to increase the capacity of the process, this is considered the refining. With this, the paper will finally be obtained.

IV.RESULTS

Once the analysis of the following work has been carried out, it is possible to establish the following results:The two types of organic paper processes based on banana pseudostem, the times that are delayed due to their cooking processes, consist of 120 minutes to obtain a dark brown color, with a time of 150 minutes the color is medium brown and with a duration of 180 minutes a shade of brown color was achieved. Likewise, each stage of the process plays a fundamental role so that the finished product is optimal and the resources are used in the best possible way.

On the other hand, when contrasting process 1 with process 2 in relation to the times, significant changes were observed between them, the colors obtained were sand tone, camel tone and a medium beige tone, due to the fact that the raw material was subjected to a soaking process. Similarly, the texture obtained is usually rigid, medium fine and fine, which is why organic paper has a clear acceptance in the market, because consumers have been inclined towards more environmentally friendly products, satisfying the growing demand for paper through its fibers and banana pseudostem.

On the other hand, and taking into account the commercial aspect, it has been shown that during the year 2020, in order to supply the demand for white paper, it is necessary to build two plants per year capable of producing approximately one million tons of bleached eucalyptus pulp. This is undoubtedly a shocking figure in comparison with the environmentally friendly process proposed in this work. Figure 2 describes the possible supply chain for paper production.

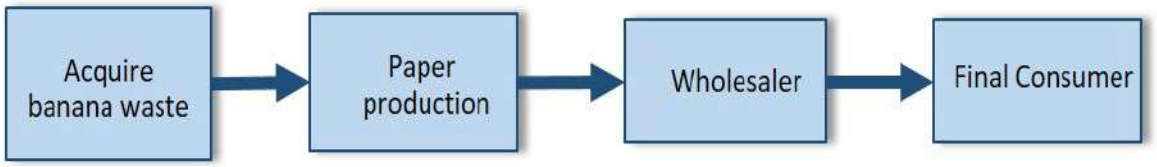

Fig. 2. Supply chain for paper production

Finally, this process provides vitality to the environment and has a focus on the circular economy, which is conceived as the use of resources, reducing the input of materials and aiming to complete the full cycle of an ecological flow, ensuring sustainability and influencing the reduction of waste, in this case, ensuring a more environmentally friendly paper.

V.CONCLUSIONS

A.This work allows us to learn about a new process that despite its great potential has not been implemented in society and this allows us to see it as a possible project for banana producing countries as a future source of income and environmental care.

B.Although the production costs of banana paper are higher compared to the cellulose that comes from the felling of trees, alternatives could be found to reduce costs and thus make it more attractive to the final consumer.

C.As an alternative proposal at the country level, this could be thought of as a process in collaboration with the state to avoid deforestation and be subsidized in the following way part by the state in order to control the erosion of places that are affected by indiscriminate logging.

D.The impact that this new process generates does not affect society only from the environmental point of view, but also allows us to dynamize a new commercial and industrial opportunity, becoming a change in the structure of thought of all the people who are part of the process, generating awareness and a new way of seeing the world. This new process may in the future be a reference to become a change in the productive matrix for banana producing countries.

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Evaluation of Ergonomic Models and Methods Applicable in Basic Industries

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Abstract: To evaluate ergonomic models and methods and to know which one or ones to apply are the most common questions, so this research aims to evaluate different models and methods to know the key factors for improvement in the workplace. A bibliographic review was carried out, being from the methodological point of view a descriptive study. It was determined that the methods applied evaluate the efforts in function of the postures that determine musculoskeletal disorders in a general way, indicating only the levels of risks without considering actions for change, and as for the models, these are focused on safety, quality and labor productivity to increase the effectiveness of the improvements. Finally, a holistic model is presented that synthesizes the key variables for evaluations and improvement actions in the basic sector of the primary aluminum industry.

Keywords: Evaluation, Ergonomic Methods, Workstations, Musculoskeletal Disorders.

Evaluación de Modelos y Métodos Ergonómicos Aplicables en Industrias Básicas

Resumen: Para realizar las evaluaciones de los modelos y métodos ergonómicos y saber cuál o cuáles aplicar son las interrogantes más comunes, por lo cual la presente investigación tiene como objetivo evaluar distintos modelos y métodos para conocer los factores claves de mejoras en los puestos de trabajo. Se realizó una revisión bibliográfica siendo desde el punto de vista metodológico un estudio de carácter descriptivo. Se determinó que los métodos aplicados evalúan los esfuerzos en función de las posturas que determinan los trastornos musculo-esqueléticos de manera general indicando solamente los niveles de riesgos sin considerar acciones de cambio, y en cuanto a los modelos, estos se enfocan hacia la seguridad, la calidad y la productividad laboral para incrementar la efectividad de las mejoras. Finalmente, se presenta un modelo holístico que sintetiza las variables claves para evaluaciones y acciones de mejora en el sector básico de la industria del aluminio primario.

Palabras Clave: Evaluación, Métodos Ergonómicos, Puestos de Trabajo, Trastornos Musculo-Esqueléticos.

I.INTRODUCTION

Ergonomics is a science that was born as a consequence of the musculoskeletal ailments or disorders that workers manifest when performing their tasks or activities. The Spanish Ergonomics Association defines ergonomics as the interaction of a multidisciplinary team with the aim of adapting products, systems and artificial environments to the needs, limitations and characteristics of their users, optimizing efficiency, safety and well-being [1].

In order to carry out evaluations to determine the risks associated with the postures adopted by the worker, researchers created ergonomic evaluation methods. Each method was created by a multidisciplinary team in order to incorporate variables and factors that allow comprehensive data to be analyzed and improvement actions to be taken.

Regarding the methods, they are classified according to their applicability. For example, there are those that allow evaluating the general working conditions, load handling, repetitiveness, and postural load, among others. For the purposes of the research, it was determined to evaluate those of postural load because they are the most used. It could be inferred that this could be because the most common occupational diseases are musculoskeletal disorders, which represent the highest proportion other than cancer. It is appropriate to point out that the most reported diseases in 2004 were musculoskeletal diseases. It could be inferred that these figures are increasing from previous years. [2], [3], [4].

However, according to theoretical and practical evaluations carried out with each of the methods, it was detected that to evaluate postural loads it is necessary to apply more than one method because the information generated is very ambiguous. This situation leads to apply other methods in order to have more reliable results. However, it was also determined that applying several methods to the same task generates results that lead to confusion regarding the actions to be considered in relation to the level of risk obtained.

There are innumerable methods proposed for the recording and evaluation of postural loads, or other factors associated with musculoskeletal disorders, but they are applied to specific cases, which lead to a comprehensive assessment and thus more effective actions [5].

Both the Rapid Entire Body Assessment (REBA) and Rapid Upper Limb Assessment (RULA) methods do not consider organizational factors, a fundamental aspect for ergonomic assessments, in addition, neither the work rhythm, the duration of recovery periods, nor the number of workday breaks. On the other hand, it was detected that if the load is greater than 10 kilograms, it always produces a similar result. Therefore, it is recommended that these methods be applied to obtain preliminary information and then use other methodologies to better specify the information and the action to be taken. [6], [7].

As for (Ovako Working Posture Analysis System) OWAS is one of the most used methods for being useful, for the identification of inadequate postures, however, it cannot be used to determine the precision of the degrees of inclination that the body would have when performing the tasks. They also indicate that, although it allows a combination of codifications that represent posture as well as strength, the results are very general. Likewise, another aspect that was detected is that a certain time of observations is required to determine the most significant frequencies and postures. [7], [8], [9].

Due to the above considerations, the objective of the research is to evaluate the ergonomic methods and models in basic industries, with the purpose of knowing the significant elements and/or factors, to create a holistic model, which synthesizes the key variables for evaluations and improvement actions, in the basic sector of the primary aluminum industry.

For the determination of the factors, a bibliographic review and research of works where ergonomic methods were applied were carried out. From the methodological point of view, the study is of a documentary and descriptive nature in order to validate the applicability of the models. Thus, a comparative analysis was carried out which generated conclusive results.

II.DEVELOPMENT

There are several models and methods used by specialists in order to evaluate jobs according to the risks that may be present in the inherent activities towards the worker. Each one has different variables to consider in order to obtain feasible results that contribute to improve and minimize risks and musculoskeletal disorders.

Regarding the methods, as each one has its purpose and relevance, several classifications were made, such as: Postural Load, Load Handling, Forces and Biomechanics, Repetitiveness, Office Positions; Global Assessment; Thermal Environment and Utilities [10].

For the purposes of the research, the authors considered evaluating those classified in the Postural Load. Having made the above observation, the methods to be developed are: RPE, OWAS, RULA and REBA. In this order of ideas

we have the following:

A.EPR Method (Rapid Postural Evaluation)

The EPR is a tool that allows a general and preliminary evaluation to determine the static load. It should be noted that the assessment system used is the LEST method (Laboratory Method of Economics and Sociology of Work), so the EPR proposes a performance level between 1 and 5. It should be noted that the EPR makes a global assessment of the different postures adopted and the time they are maintained. Fourteen possible generic positions are specified [11].

Depending on the result obtained and because it is preliminary diagnostic information, it is advisable to carry out a more in-depth study using one of the postural loading methods such as OWAS, REBA, RULA, in that order of application.

B.OWAS Method (Ovako Working Posture Analysis System)

OWAS was created in 1977 by a multidisciplinary team in order to promote postural evaluations due to the fact that workers were suffering from ailments and thus had little effectiveness in performing their tasks. This method is based on observation with the purpose of defining the posture and classifying it. The code is established according to classification and an evaluation of the risk level is obtained to specify corrective actions in order to improve the workplace. It is a method that has generated important contributions, as well as other methods. It should be noted that the most widely applied methods to assess the physical postural load are OWAS, RULA and REBA. [12], [13].

C.RULA Method (Rapid Upper Limb Assessment)

RULA is a method developed by McAtamney and Corlett for use in assessments involving the human body, specifically the upper limbs.

To apply it, the division of the body must be considered, i.e., right and left side separately. Based on the posture, a score is established which leads to a total value according to the crossing of the variables. Thus determining the level of risk and the action considered, in order to take the necessary steps for improvement and minimize the possible musculoskeletal disorder.

It should be added that the RULA method does not provide detailed information, such as finger position. So it is advisable to collect information in a general way, and thus use other more comprehensive ergonomic assessment tools [14].

D.REBA Method (Rapid Entire Body Assessment)

This method is based on RULA parameters in order to incorporate variables that allow more viable results towards postural load assessments.

The purpose of the method is to determine the levels of risk associated with the task performed by the worker that is why individual postures are considered for its application. It should be noted that the correct posture is the Neutral position, so those that are outside this condition are considered, in addition to the duration or frequency. For this purpose, the method allows a comprehensive evaluation of the positions adopted by the upper body members (arm, forearm, and wrist), trunk, neck and legs. In addition to this, it considers other variables such as the force performed at the moment of manipulating a load, as well as the type of grip performed.

It should be noted that this method is the most widely used in practice because it is particularly sensitive to tasks involving unexpected changes in posture. In this sense, there are many studies that endorse the REBA as one of the most widely used tools in postural load analysis. [15], [16].

In short, it can be said that the method generates important contributions in the evaluations, however, it is necessary to contrast it in order to detect its advantages and disadvantages, for example, one of the ways to evaluate is to observe the posture and to see the inclination angle that it has in the joint of the evaluated part. Regardless of the angle, the method tells you to consider a fixed score.

The aforementioned methods allow a broader perspective of risk situations with a view to an integral or holistic model in ergonomic matters.

E.Ergonomic Management Models

The purpose of the occupational health and safety model, with integrated management for the sustainability of organizations, is to promote healthy lifestyles among workers, as well as to improve working conditions and care of the

environment with quality and productivity [17]. Figure 1 shows the model and it can be seen that one of the factors considered was ergonomics.

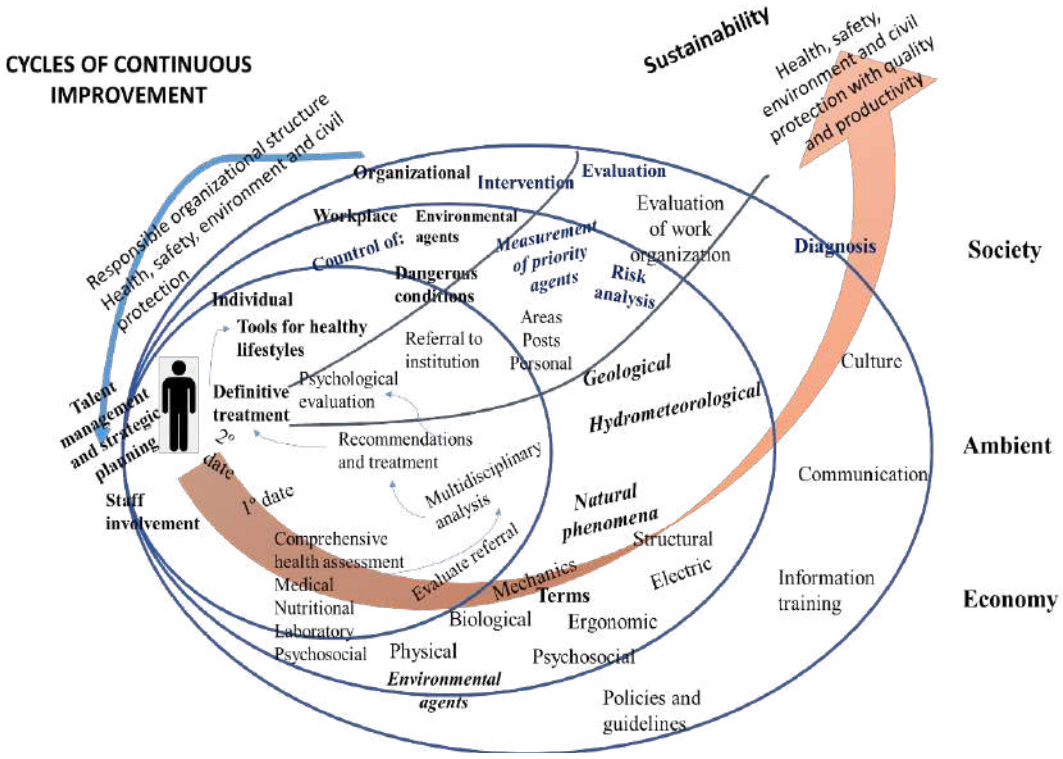

Fig. 1. SSeTGIS model. Components by levels of action and process.

For the development of the model, the author considered as important components: health, hygiene conditions at work, and safety conditions at work, environmental care, as well as quality and productivity as integral management. It should be noted that among her conclusions she states that her model differs from others because it focuses on taking health and safety at work as a perspective centered on people as the first beneficiaries and participants in the work culture it promotes.

On the other hand, the ergonomics maturity model for companies, is presented so, that they can evaluate the capabilities they possess, and based on the results, be able to draw up strategies aimed at introducing, applying and developing ergonomics in companies, integrating it into processes and contributing to the fulfillment of the organization's objectives [18].

The aforementioned authors considered several levels where a set of characteristics related to the recognition of ergonomics were proposed for each level, thus generating the model represented in Figure 2.

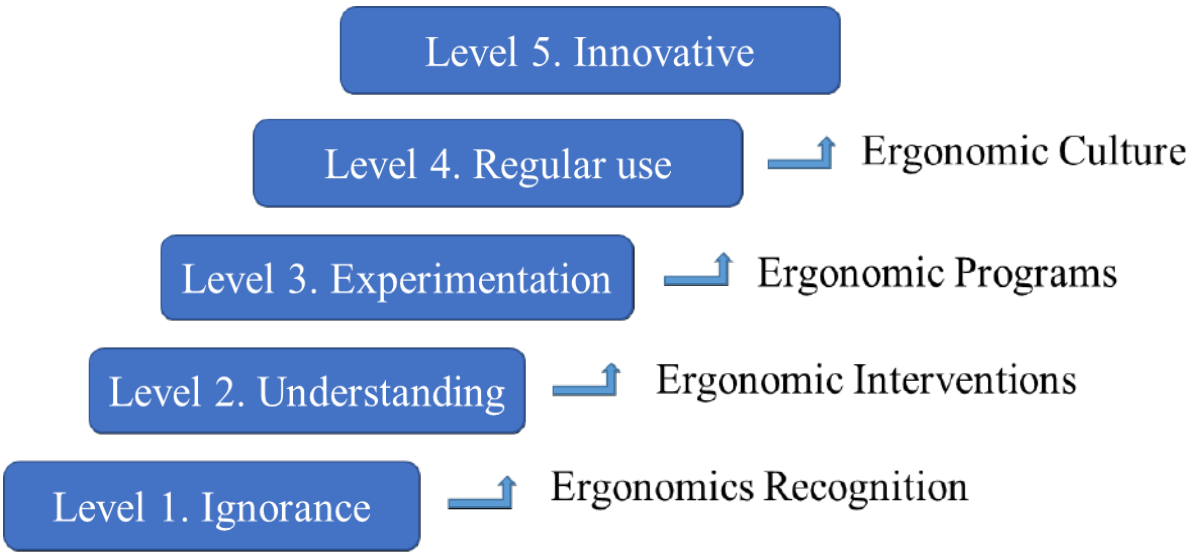

Fig. 2. Ergonomics Maturity Model for Companies

Level 1 refers to the lack of knowledge of ergonomics and the benefits it generates for the development of production processes, as well as improvements in the worker's quality of life.

Levels 2 and 3 emphasize the benefits and application of ergonomics in order to minimize possible illnesses, as well as worker safety. Towards level 3, small projects are developed hand in hand with the ergonomist and the engineer.

Level 4 focuses on training and qualification of workers, but mainly to senior management, with the purpose of assuming commitments and recognizing ergonomics as a means that contributes to the achievement of objectives. And finally, level 5 promotes the successful integration of ergonomics as part of management strategies. At this level, the employee plays a very important role because their opinions are the basis for the implementation of improvements. Likewise, there are already indicators to monitor and make adjustments according to the deviations that may occur.

Now, for the evaluation of the model they considered a company where the maximum level reached was Level 2, however, of the evaluated elements , two of them were positioned in level 1; then, they concluded that their classification is located in the lower level 1 (Ignorance). The information obtained from the model allows the companies to see how they are doing, and thus carry out improvement actions towards the implementation of ergonomic programs.

In the same order of ideas, the strategic model for the implementation of ergonomics in operations management is presented. Its implementation will allow organizations to apply ergonomics knowledge to production operations, in relation to technologies, work organization and human resources [19].

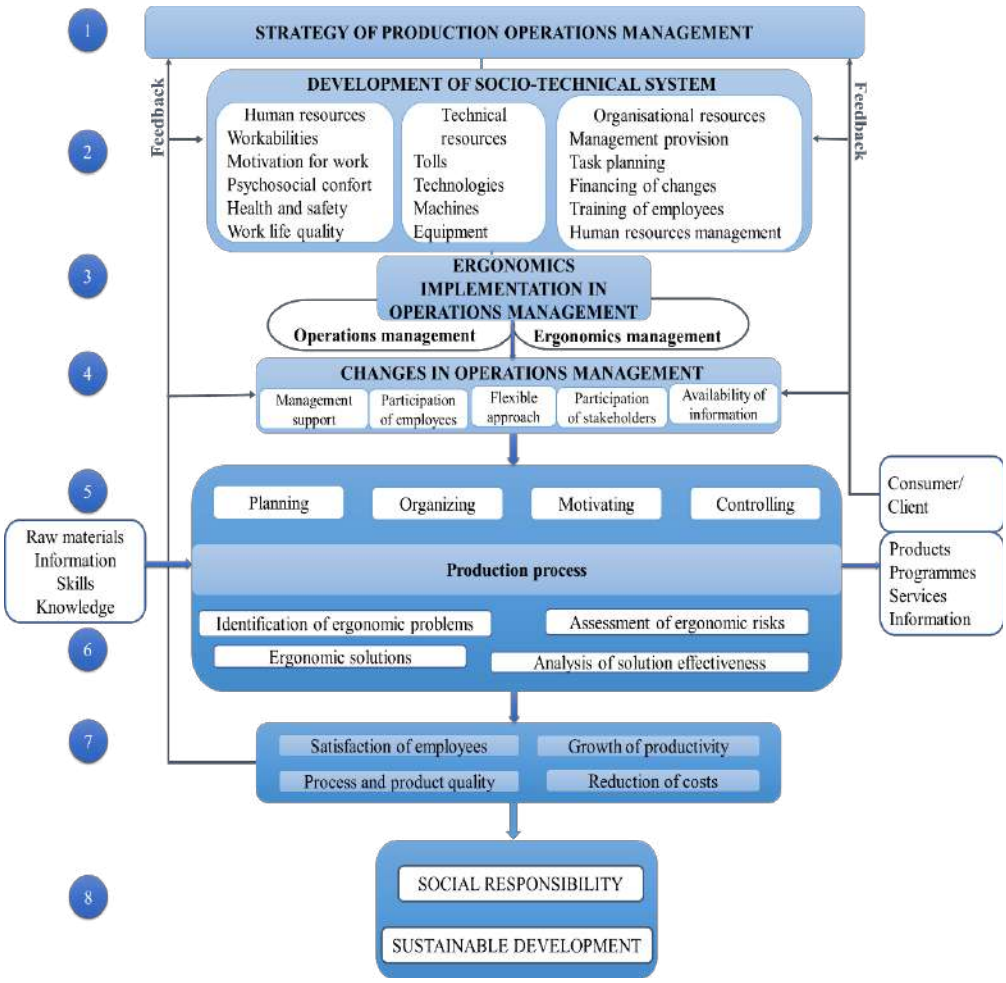

Fig. 3. Model "Ergonomics Implementation in operations management.

Figure 3 show that the application of the model leads companies to achieve Social and Sustainable Development as a result.

The authors state that the application of ergonomics should be carried out in terms of operation and ergonomics management. That is why in level 3 they present the integration of both. They state that the results will be more effective because the quality standards will also be taken into account.

In addition to the above, they considered at level 4 aspects such as worker participation, management support, flexibility, availability of information and stakeholder participation. Indicating that the lack of any of them would significantly decrease the effectiveness of ergonomic solutions.

In addition to the above, the aspects at level 6 were considered because they are the ones that will allow to control the deviations in the process. Because at this level it will be possible to identify problems and thus analyze them in order to carry out corrective actions aligned with management strategies. However, they also considered the client as a fundamental piece because he is the main consumer and therefore the one that allows feedback towards management improvements.

Finally, they express that the elements indicated by levels add up to a whole and influence each other, generating results towards a social responsibility that is the basis for the sustainable development of the organization.

On the other hand, it is important to refer to the ISO 45001 safety management system standard because it provides a new model that can be used as an effective system to manage ergonomics [20]. ISO 45001 is an international safety management system standard that was published on March 15, 2018; its content is aligned with the Deming Cycle. The model for managing ergonomics based on ISO 45001 states that all levels of the company must be engaged and empowered in ergonomics processes. Each responsibility must be well defined, as well as their ergonomics education and training. In addition to the above, it indicates that effective controls must be applied in risk reduction, both in the

workstations and in the task performed by the worker. And with this, the necessary resources must be established, as well as the review of ergonomic operations.

III MATERIALS AND METHODS

In order to validate the results of the methods applied to different tasks, several evaluations were made at the documentary level based on the search for data, its capture and critical analysis to interpret data from primary and secondary sources reflected in reports and information of the study subject matter in the company taken as a reference.

The sources and documents obtained were of a secondary nature from the works of other authors referenced where appropriate, and in accordance with their research nature; the source came from textbooks, specialized articles, reports and case studies, and reports of the company selected for the study, which was CVG VENALUM, the only primary aluminum reducing company that allowed the development of the research.

Due to the above conditions, the research is descriptive because the characteristics were identified, which allowed comparisons between the methods and analysis of the models, in order to determine the variables contained in each one and to define the advantages and disadvantages. In this aspect is the study of the variables independently, it is part of describing the characteristics, in addition to determining the behavior of the variables [21].

This research is circumscribed as documentary type because bibliographic sources were used to be analyzed and evaluated in order to respond to the subject under study. And field research because we interacted in the selected company with the processes and personnel involved in the tasks evaluated in the reduction area. [22].

It is appropriate to point out that, for the selection of papers, articles or information for the evaluation, the selection criteria were those that presented results focused on the limitations or weaknesses of the methods. Thus, excluding those that only considered for the evaluations the use of the methods in order to generate specific results for a particular position or task.

As for the sample studied, thirty-five works were evaluated, corresponding to degree theses, internships and articles in indexed journals. The research was carried out in databases such as: PUBmed, Dialnet, and Scielo.

IV RESULTS

Each method has important contributions to the evaluation of risks associated with postural load, so it is necessary to contribute with other variables and factors that strengthen the postural load evaluations. Table 1 below shows the details of the methods, showing the advantages and disadvantages of each one, as well as their objectives.

Table 1. Characteristics of the methods.

Method	Target	Features	Advantages	Disadvantages
EPR (Rapid Postural Evaluation)	It allows a first and brief assessment of the postures adopted by the worker throughout the day.	• EPR uses the LEST method static load rating system.	• Performs an overall assessment of the different postures adopted and the time they are maintained.	• It does not evaluate any specific position. • It considers 14 generic positions.
OWAS (Ovako Working Analysis System)	Improve work methods, based on the identification and elimination of forced postures.	• Evaluates positions jointly. • The positions are classified in 252. • It distinguishes four risk categories for each posture. • Validated in tasks of risk for the lumbar area.	• Individual risk category. • Results with a confidence level of 90% or more. • Very didactic. • Applicable for different types of jobs	• Overall results. • Registration ranges from 20 to 40 minutes. • A minimum of 100 samples is required. • Use wide ranges of categories.
RULA (Rapid Upper Limb Assessment)	To evaluate the exposure of workers to risk factors that cause a high postural load and that can cause disorders in the upper limbs of the body.	• Evaluates individual positions. • The measurements on the postures adopted are fundamentally angular. • Evaluations of the sides (right and left) are performed separately. • Observations are made for several cycles.	• Evaluates a working posture and the associated level of risk in a short period of time. • Brief results of previous musculoskeletal injuries. • It is useful for comparing existing and proposed workstation designs.	• Assesses upper extremities • It was not designed to provide detailed postural information. • Does not provide a sub classification for different regions of the body
REBA (Rapid Entire Body Assessment)	Assess the degree of exposure of the worker to risk due to the adoption of inadequate postures.	• Based on RULA • Evaluation of the upper extremities. • Analyzes as a whole the positions adopted • Evaluates the load and grip • It assesses muscle activity (both in static and dynamic postures). • Coding for muscular activity originatedby static, dynamic postures,	• Sensitive to musculoskeletal risks. • Analyzes the impact of load handling on postural load. • Assess postures with abrupt or unexpected changes. • Generates a level of action with indication of priority or urgency.	• Applies only to postural load evaluations. • It evaluates individual postures and not a set or sequence of postures. • It does not provide a sub classification for different regions of the body. • evaluates left and right side separately.

It is evident that, although the methods focus on the evaluation of postures, they agree on an evaluation system that indicates the level of risk and action to be taken according to the task being evaluated. Likewise, they allow detecting inadequate postures. It was determined that REBA and RULA are similar in their application. Both consider the right and left sides separately. They differ in that REBA considers the handling of loads. These methods differ from OWAS in the type of results. That is, OWAS provides more general results and the others, more specific.

Table 2 shows some of the tasks evaluated in the aluminum company, specifically the reduction area, which, according to the results of medical evaluations, is the area with the highest incidence of MSDs (MusculoSkeletal Disorders). The results of the methods applied in ergonomic evaluations are as follows:

Table 2. Results of the REBA and RULA methods in ergonomic evaluations.

Activity	REBA	RULA
Anodic Current Distribution Measurement in Cell	**Score: 4** **Risk Level**: Medium **Action**: Action is necessary.	**Score: 3** **Risk Level**: Medium **Action**: Redesign of the task is required.
Bath and Metal Level Measurement	**Score: 6** **Risk Level:** Medium **Action:** Action is necessary.	**Score: 5** **Risk Level:** Medium **Action:** Redesign of the task is required.
Maneuver Cell Side Cover	**Score: 11** **Risk Level:** High **Action:** Immediate action is necessary.	**Score: 7** **Risk Level:** High **Action:** Urgent changes in the task are required.
Oven Crust Breaking	**Score: 10** **Risk Level:** High **Action:** Action is needed as soon as possible.	**Score: 7** **Risk Level:** High **Action:** Urgent changes in the task are required.
Measure Worn Anode	**Score: 6** **Risk Level:** Medium **Action:** Action is necessary.	**Score: 4** **Risk Level:** Low **Action:** Changes in the task may be required; further study is desirable.
Hole Skimming	**Score: 11** **Risk Level:** Very High **Action:** Immediate action is necessary.	**Score: 7** **Risk Level:** High **Action:** Urgent changes in the task are required.
Extraction of Coal Bits	**Score: 11** **Risk Level**: Very High **Action:** Immediate action is necessary.	**Score: 7** **Risk Level**: High **Action**: Urgent changes in the task are required.

It is determined that the methods have very similar results in almost all tasks, although they have different scores. In general, the levels of action are oriented towards improvements or changes that will benefit the worker in the operating conditions. It could be inferred that the similarity is due to the fact that the creation of the REBA method was based on the variables contained in RULA.

However, with respect to the application of the OWAS method in conjunction with some of the two previous methods, very similar results emerge in terms of risk levels and actions. Table 3 shows the evaluation of some activities and their results according to the method considered.

Table 3. Results of the OWAS, RULA and REBA methods in ergonomic evaluations. REBA methods in ergonomic evaluations.

	Risk Level: Very High Action: Corrective action is required immediately.	Risk Level: High Action: Urgent changes in the task are required.
Hole Skimming	**Score: 3** Risk Level: High Action: Corrective action is required as soon as possible.	**Score: 7** Risk Level: High Action: Urgent changes in the task are required.
Activity	**OWAS**	**REBA**
Oven Crust Breaking	**Score: 2** Risk Level: Medium Action: Corrective actions are required in the near future.	**Score: 10** Risk Level: High Action: Action is needed as soon as possible.
Positioning Lid to cover cells	**Score: 3** Risk Level: High Action: Corrective action required as soon as possible	**Score: 9** Risk Level: High Action: Action is needed as soon as possible.

Table 3 shows different scores and risk levels in some tasks. However, in general, the actions are very similar. The results may cause uncertainty in the evaluators at the time of performing or executing appropriate improvement actions.

It should be noted that the methods do not indicate in depth the action to be taken, so it will be the evaluator, together with a multidisciplinary team, who will decide on the changes to improve the worker's conditions. However, it is important to continue with studies and research that generate methods that include variables that allow the collection of more in-depth information, as well as recommendations for broader actions aimed at the effectiveness of the processes.

However, in general, some models allow companies to be evaluated in a comprehensive manner in order to determine their management capabilities, and to carry out improvement actions towards the implementation of ergonomic programs, as in the case of this study.

The purpose of the models is to integrate each department of the company because they consider that the commitment must be promoted from the top management in order to assume the cultural changes of the worker. In addition, they promote an integral strategic management where health, environment, hygiene at work, quality, productivity, but above all, worker's commitment, are considered as fundamental pillars. Finally, it is evident the importance of creating a model that considers the interrelation of the strengths of the methods already created with the purpose of having an advance in the results of the evaluations of the postural loads. Figure 4 shows the ergonomic management model created by the authors.

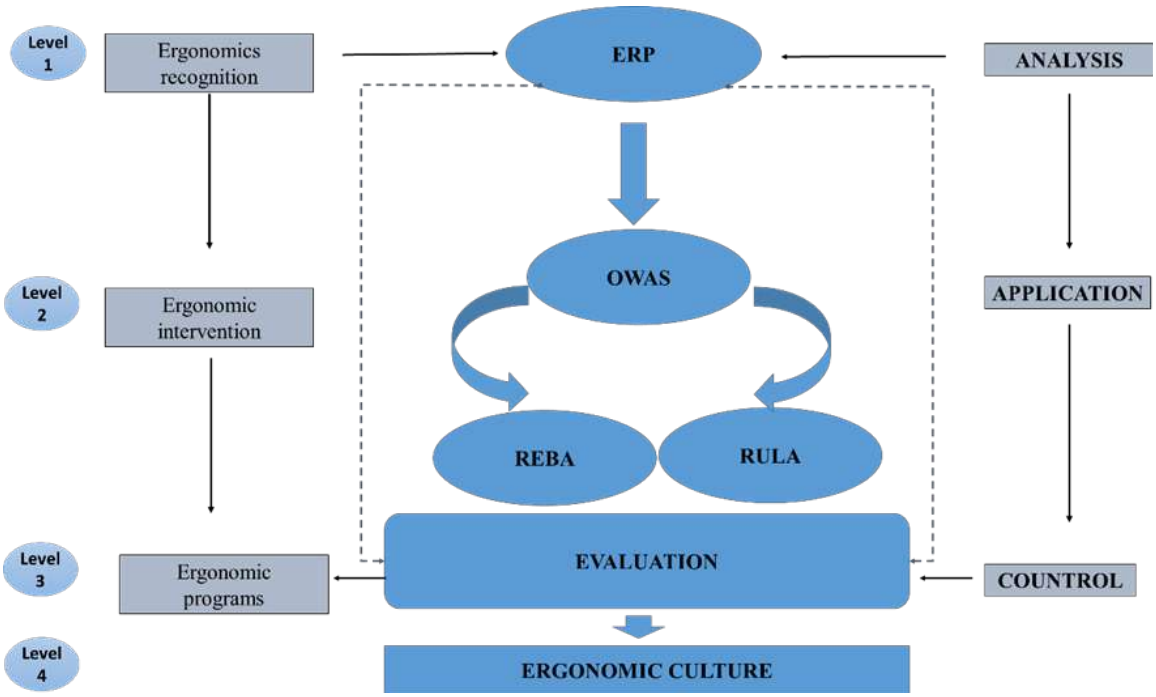

Fig. 4. Ergonomic management evaluation model for manufacturing processes Source: Authors

With the model shown in Figure 4, it is intended to demonstrate that companies must recognize that ergonomics is essential for the effective development of management, because it will allow them to have workplaces that are in accordance with the worker and the established occupational health and safety standards. Therefore, the first level presents the recognition, aligned with the analysis of postural loads with the EPR methodology, in order to obtain a first approximation or diagnosis of postural risks in the worker. Next, level 2 emphasizes the ergonomic intervention by applying the OWAS, REBA and RULA methods, complementing the information that will allow detecting the levels of risks associated with the task performed by the worker.

Level 3 establishes the importance of creating ergonomic programs aligned with occupational health and safety standards in order to be applied, evaluated and controlled, based on indicators or criteria that the company considers to measure the quality of its processes.

Finally, at level 4, by considering the integration and participation of the worker in the implementation of ergonomics, the commitment and culture of behavior based on safety and health will be encouraged.

V.CONCLUSIONS

The study reflects, after a comparative analysis, some methodologies that evaluate the efforts according to the determining postures in musculoskeletal disorders, based on general evaluations that only indicate risk levels without considering actions for change, while other methodologies focus on safety at work, quality and business productivity.

In particular, the Rapid Postural Evaluation (EPR) methodology allows for a general and preliminary evaluation in order to determine the static load. In this sense, the EPR performs a global assessment of the different postures adopted and maintained over time and the result obtained is preliminary information that recommends a more in-depth study using one of the postural load methods.

The Ovako Working Posture Analysis System (OWAS) methodology starts with observation in order to define the posture and classify it. It establishes a code according to classification and facilitates anassessment of the level of risk, and thus the corrective actions to improve the work posture are specified.

The Rapid Upper Limb Assessment (RULA) method evaluates actions that involve the human body, specifically the upper limbs. It is applied considering the division of the body into right side and left side separately. Based on the posture, a score is established which leads to a total value according to the crossing of the variables, thus determining the level of risk and the action considered for the management of improvement in minimizing possible musculoskeletal disorders.

As for the Rapid Entire Body Assessment (REBA) method, it determines the levels of risks associated with the task performed by the worker, which is why it considers individual postures for its application. The method allows a comprehensive evaluation of the positions adopted by the upper body members (arm, forearm, and wrist), trunk, neck and legs, and the force performs by worker when handling a load, as well as the type of grip.

The comparative evaluation of ergonomic study methodologies revealed a gap that is filled by integrating into one model, the multiple methodologies that take into account the key variables, of ergonomic management, in the basic industrial sector.

The model in its first phase, allows to make a recognition of ergonomics in the company with the EPR methodology. In a subsequent step, it proposes to carry out the ergonomic intervention, combining the OWAS, RULA and REBA methods that give the framework of integrality. Finally, programs are applied to consolidate the ergonomic culture.

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New Information and Communication Technologies in Education in Times of Pandemic

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Abstract: New trends in computer tools accelerate people's cognitive processes; their use in daily life has significantly changed human needs, making the way of receiving information and assimilating communication processes more and more demanding. The new times sustain an inherent need to use computer tools for training and education in general, but it has been COVID-19 who has awakened with greater force the use of technology for human interaction, academia, business, and all professional branches in all its forms. In this work, the use of information and communication technologies in the university teaching process during the pandemic period was analyzed. A descriptive and bibliographic study was carried out. The analysis led to the conclusion that it is necessary to reinforce training in the use of new technologies, in order to take advantage of the resources to offer better academic alternatives

Keywords: Computer tools, teaching - learning process, educational technology.

Nuevas tecnologías de la información y la comunicación en la educación durante tiempos de pandemia

Resumen: Las nuevas tendencias en herramientas informáticas aceleran los procesos cognitivos de las personas, su uso en la vida diaria ha cambiado notablemente las necesidades humanas, siendo cada vez más exigente la forma de recibir la información y asimilar los procesos de comunicación. Los nuevos tiempos sostienen una necesidad inherente de usar herramientas informáticas para la formación y la educación en general, pero ha sido el COVID-19 quien ha despertado con mayor fuerza el uso de la tecnología para la interacción humana, la academia, los negocios, y todas las ramas profesionales en todas sus formas. En este trabajo se analizó el uso de las tecnologías de la información y comunicación en el proceso de enseñanza universitaria durante el tiempo de pandemia. Se realizó un estudio descriptivo y bibliográfico. El análisis realizado condujo a la conclusión de que hace falta reforzar la formación en el uso de nuevas tecnologías, con el fin de aprovechar los recursos para ofrecer mejores alternativas académicas.

Palabras Clave: Herramientas informáticas, proceso enseñanza – aprendizaje, tecnología educativa.

I.INTRODUCTION

The pandemic time has exposed many organizations and institutions, in all professional areas, and has shown the technological needs to face the new times. Modern society is in a process of transition, where technology is combined with the processes of communication and information exchange, breaking down spatial, temporal, cultural and social barriers. The need to implement the use of electronic devices is becoming more and more evident, not only in the field of communication, but also in other fields such as commerce, science, entertainment and education, which has become indispensable in daily life [1], [2].

The pandemic forced mankind to change their lifestyles, their way of seeing and dealing with things. Thus, it has become increasingly necessary to use IT tools in order to achieve professional goals faster and more effectively. This need has driven people to handle more and more technological equipment, technological applications and computer tools to support work needs.

The impact of ICT has become a key factor in many studies to understand how new technologies could be a catalyst and driver of changes in the processes themselves, and also an element to support change in organizational environments [4], [5]. This methodology is of vital importance for all higher education institutions, since it helps the teacher to make decisions in the teaching-learning process.

In this work, the use of information and communication technologies by teachers in university teaching during COVID-19 was analyzed and contrasted with that proposed by the authors in [1], in order to obtain a global vision of ICT in the formative process of students and teachers, and thus be able to focus on a useful scenario for curricular reforms according to the new societies.

The IT tools of some universities must be constantly updated in order to be in tune with the new professional requirements [6]-[8]. For [1] the needs were focused on virtual classrooms, educational applications, computer labs, digital whiteboards [9], however at present the technological needs are even greater, including interactive games, padlets, and a host of products that enrich academic training.

II.DEVELOPMENT

Some authors [5] have stated that technological education involves various scientific currents ranging from physics and engineering to pedagogy, without excluding communication theory. For their part, other authors [5] recognize that education can no longer be just an isolated profession, it must be accompanied by a set of complementary elements, and that computer tools are an inevitable necessity in the process of academic training [5], [6].

Information and communication technologies are the set of technologies that enable the acquisition, production, storage, processing, communication, recording and presentation of information in the form of image, voice and data. Technological tools include electronics as a base technology that supports the development of telecommunications, computer and audiovisual [1].

The COVID-19 pandemic has been an unexpected situation for the world, yet many academic institutions were prepared to take on new teaching models. But others lacked the infrastructure to support academic needs through technology. This diversity of situations has caused a general uncertainty about the results of training in basic education and university students.

Universities with strict regulatory bodies were better prepared to take on online education, but basic education institutions lacked the technological infrastructure to take on the challenges of academic virtuality. Moreover, basic education does not have the necessary preparation for online teaching methodologies. This deeply worsens the situation of young people in secondary education.

Education should complement the social formation of individuals, consequently, it should be added to the use of technological tools that involve interactivity, allowing communication between users, enabling them to be passive spectators to act as participants [12]. In addition, it facilitates interconnection, making it possible to instantly access many databases located at a great physical distance [10]. Interconnection allows many sites to be visited and facilitates real-time communication between people. Educational technology can also achieve instantaneity, allowing the reception of information in good technical conditions in a very reduced space and time almost instantaneously, being able to access distant populations or people who for different reasons prefer to receive classes without leaving home [2].

In remote times, education was focused on the professional training of the individual, but today education includes personal training and interaction with various technological, social, industrial and economic scenarios, so it is necessary to use more advanced tools that adapt to the concerns of the modern world.

At present, educational software is immersed in the same virtual classrooms, in phone applications, in the daily use

of things, hence education must reinvent itself to offer a different form of training, which allows a real interaction with the world but also offers the traditional theoretical foundations of the subjects, using modern teaching methods.

III.RESULTS

Until 2018 it was evident that teachers only focused their educational methods in the traditional way, and in the technological part they only concentrated on the use of personal computers and slide projectors [1], leaving aside all the complementary technological tools. At present, the teaching and technology activity involves a wide variety of resources (fig.1) that include industrial interaction with the current world, for the placement of students in real scenarios and with a view to projects within business contexts according to the profession of each one.

Fig.1 shows some applications that are currently used in a common online class, and it can be seen that classes are no longer limited to a slide but also include links to other portals that allow students to evaluate their professional projection over time.

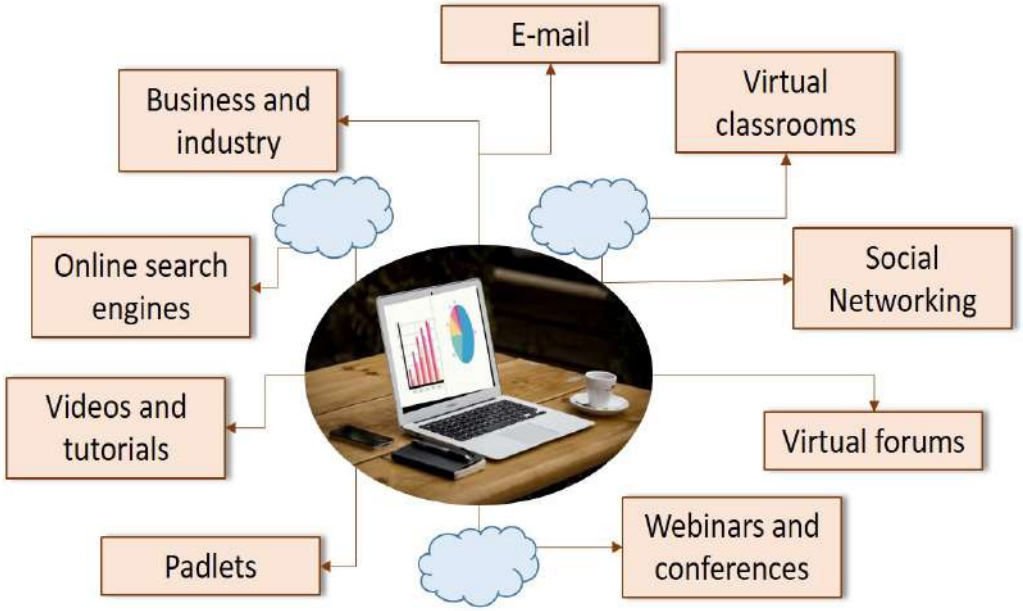

Fig.1. Computer tools used in the virtual classroom

Until a few years ago, school groups were face-to-face, but today, even before the pandemic, study groups are done with technological applications, and work in multidisciplinary teams is no longer attended in face-to-face discussions. These social changes drive education to transform itself in order to adapt to a changing society and a changing business and industrial system.

The new challenges for education, pandemic or no pandemic, will be to offer professional training that meets business demands, with practical but scientific knowledge, capable of creating adaptive, creative, dynamic, innovative and proactive professionals.

Figure 2 shows the challenges of the new education, with well-used technological tools, with a technical-scientific character and with a transcendent vision in the world of tomorrow.

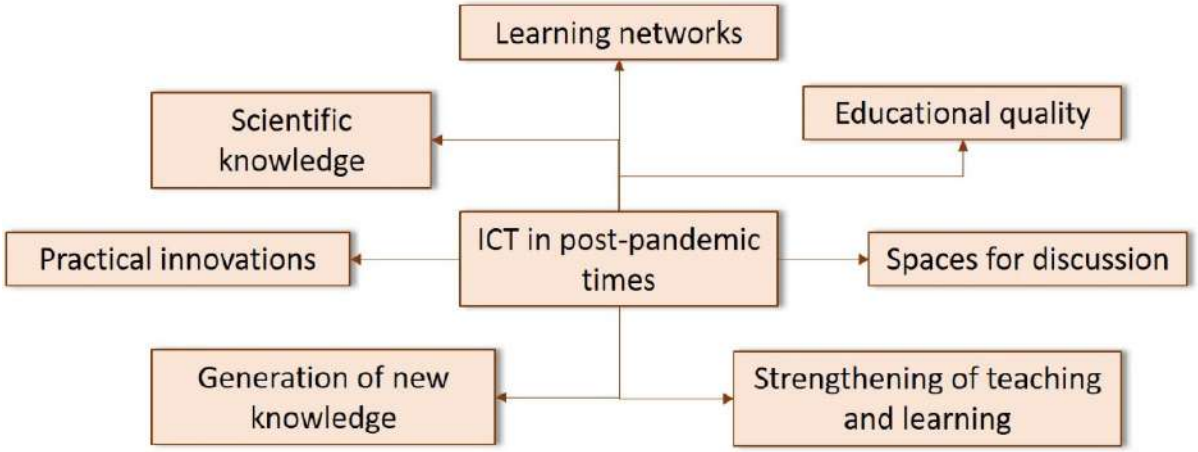

Fig. 2. New trends in education with the use of ICTs.

The time after the pandemic should be a moment of reflection for the reform of many social processes, among them the new vision of education, which will be strengthened by the use of ICTs and will also have a greater appreciation of face-to-face presence. With more open spaces for discussion, without so many limitations such as space, distance or traffic. It will also have the possibility of offering new online careers, with greater knowledge and mastery of resources, with a view to constant innovation for new digital businesses.

IV.CONCLUSIONS

After completing the following test, it is possible to draw the following conclusions:

1.Education must be redefined in order to respond to the new social paradigms and the new industrial demands. With a technological and scientific approach, which assumes the respective roles of the new society.

2.Technology must focus on industrial and scientific development, with a view to social, economic and political growth in accordance with the new ways of life.

3.Incorporating education with technology allows reformulating theories, methodologies and systems in favor of new professionals, with scientific and technical character, who are capable of assuming the challenges of modern times.

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